stormy, except during the regime of an area of high barometer over the eastern portion, which set in on the 7th and continued to the 14th, the maximum pressures of the month (about 30.70 or 779.8) occurring on the 9th to the southwest of the Irish coast. The storms having their tracks charted were generally accompanied by pressures below 29.40, or 746.8, the lowest minimum barometric reading yet reported being 28.60, or 726.5, experienced by S. S. *Republic* at 4 p. m. of the 10th in about 50° N., 35° W., in connection with the storm the track of which is given as No. I.

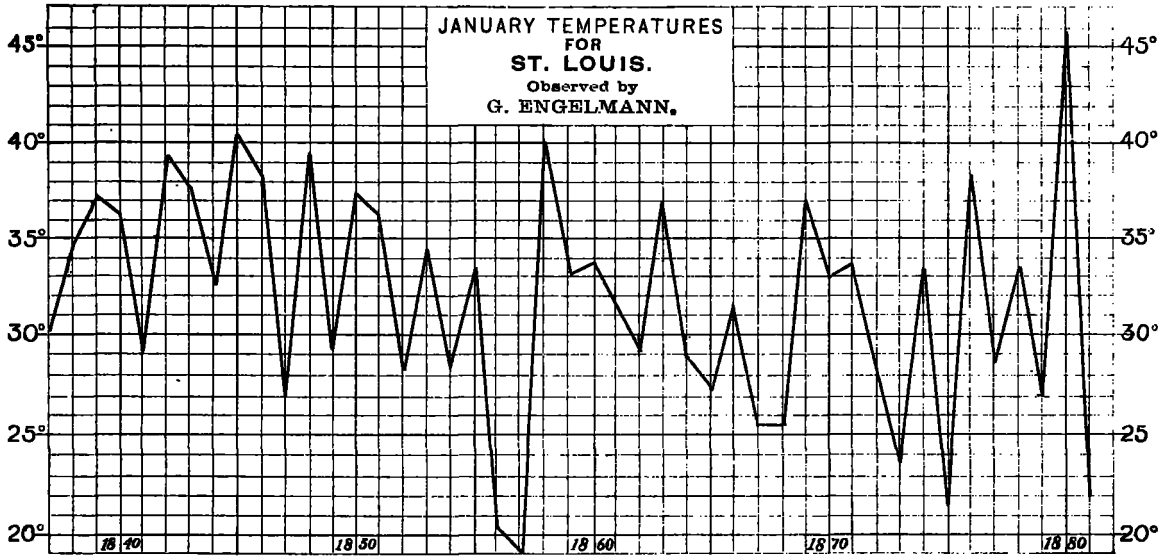
Charts No. V.—These charts, of which two are published this month, show the mean pressure, temperature and wind force and the prevailing direction of the wind at 7.35 a. m. Washington, or 0.43 p. m. Greenwich, meantime, for the months of *January* and *February*. 1877, over the northern and at certain isolated stations in the southern Hemisphere. The chart for *January* shows an immense area of low pressure (below 29.90 or 759.4) probably covering the whole of the North Polar region and apparently extending southwards over the Atlantic Ocean to the 45th parallel. The mean pressures at the most exposed northern stations are: St. Michaels and York Factory, 29.89; Godthaab, 29.20; Stykkisholm, 29.17; Thorshavn, 29.44, and Thromso, 29.58, the lowest baro metric mean being found over Iceland. The region of highest mean pressures is found to cover quite generally the zone included between the 30th and 40th parallels over the United States, Spain and Algeria, but extending northwards over eastern Europe and Asia to the 60th. The maximum mean is that of Pekin (30.45 or 773.4), giving a barometric range in the mean monthly pressure of 1.28 inches; Barnaul is 30.44 and Shanghai 30.43. The highest and lowest barometer readings, reduced to sea-level, reported by co operating observers during the month, were, respectively: Barnaul, 31.21 or 792.7 on the 9th, and Stykkisholm, 28.03 or 712.0 on the 13th, showing a total barometric range of 3.18 inches. In the distribution of temperature the region of greatest continued cold appears to have been over Hudson's Bay Territory, York Factory having a monthly mean of —23°, while Yeniseisk, the next in order, was only —11°. Extremely low temperatures were reported, as follows: St. Michael's, Alaska, —32.5°; York Factory, —42° and Nertschinsk —44°. Over the middle latitudes the predominating winds appear to have been *southerly*, except along the northern shores of the Gulf of Mexico and the Mediterranean where a decided northerly direction prevailed. The chart for February shows the same general features, the lowest barometric mean, 29.46 or 748.3 being at Stykkisholm and the highest 30.40 or 772.2 at Barnaul, giving a barometric range in the monthly mean pressures of 0.94 inch. The highest and lowest barometric readings were 30.85 or 783.7 at Barnaul on the 21st and 27.91 or 708.8 at Stykkisholm on the 1st, giving a total barometric range of 2.94 inches. The region of greatest continued cold is found over Behring's Sea; St. Michael's —26.5°. At this station the extremely low temperature of —50° was observed on the 19th. The predominating winds were *northerly* in America, Algeria and along the eastern coast of Asia, and *southerly* over Europe and western Asia. In comparing these two months, the most marked changes are found to be a large increase of pressure during February over the northern portions of America and the Atlantic, with an increase in temperature at York Factory of 18° and at Stykkisholm of 11°, and a decrease at St. Michael's of 27°. The greatest change in barometric pressure, however, is found over Russia, where a decrease of more than 0.40 in. occurred at Dorpat, Moscow, Kieff and Orenburg. The changes in temperature over Europe were small compared with those given above, but in Asia an increase of 10° occurred at Nukuss and 11° at Yeniseisk.

TEMPERATURE OF THE AIR.

The mean temperature of the air for January, 1881, is shown by the isothermal lines for the month on chart No. II. The table in the right-hand corner of this chart gives the average temperature for January in the several districts, determined from the Signal Service observations; the mean temperature for January, 1881, and the amount of departures from the mean in the last column. It will be seen from this table that the average temperature of the month has been below the normal in all districts east of the Rocky Mountains, and also in the southern districts on the Pacific coast, where it has averaged from 1°.3 to 2°.5 below. The greatest departures occurred in Texas, and northward to British America, and northeastward over the Lake region, where the temperature has ranged from 6°.5 to 9°.0 below the normal of the month. On the Pacific coast the temperature has averaged 3°.5 above the normal in the central districts, about normal in the northern district and 3°.5 above in the region of Salt Lake. The departure from the normal temperature has been greater than during the preceding month, which was the coldest, as compared with records of previous years since the establishment of the Signal Service. This month has been the coldest ever observed in the northern and eastern districts, excepting that of January, 1875; while in the Southern States, east of the Mississippi, the only years showing a lower temperature, were those of 1872 and 1873. At Washington, D. C., the average temperature was lower than that of any preceding January of which this office has any reliable record.

Deviations from Normal Temperatures.—Under this head, the departures, as indicated by reports from regular Signal Service stations are shown in the table of average temperatures on the right-hand side of chart No. II. The following interesting items from voluntary observers are of much importance in connection herewith: *California:* Oakland, mean temperature of month 3°.0

above the mean of January for past five years. *Canada:* Montreal, mean 3°.5 below that of past 6 years and lower than any January except 1875. *Connecticut:* Mystic, month remarkably cold. *Florida:* Houston, month very cold and gloomy, cotton much injured. *Illinois:* Belvidere, mean 8°.45 below that of past 14 years, and lower than the mean of any January in that period except 1875. Riley, mean 8°.20 below that of past 18 years and lower than the mean of any January in that period except 1875. Elmira, mean below that of past 19 years. *Iowa:* Clinton, mean below that of several years past. *Kansas:* Lawrence, mean 5°.94 below that of past 13 years. Holton, coldest in past 14 years. Yates Center, coldest within the memory of the oldest settler. Manhattan, month unusually cold. Clay Center, coldest in past 12 years. *Maine:* Gardiner, mean 12°.16 or 5°.76 below that of past 45 years, only four Januaries during that period giving a lower mean, viz: 1844, 7°.08; 1861, 12°.15; 1875, 10°.36 and 1877, 11°.43. *Maryland:* Fallston, mean 5°.20 below that of past 11 years. *Massachusetts:* Westborough, mean 13° below that of January, 1880, and 5°.7 below that of past 6 years. *Michigan:* Thornville, coldest for many years. *Missouri:* The Missouri Weather Service reports the mean of the month as nearly 10° below that of the past 44 years; coldest year occurring in 1857. The following is the curve of mean temperature for January, as furnished by Prof. Niphen, of the "Missouri Weather Service." As compared with the observations taken at the Signal Service station in St. Louis, during the past ten years, these observations appear to be reliable:



Nebraska: Howard mean 6° below that of past 5 years. *New Hampshire:* Auburn, coldest for several years. Grafton, mean 6°.7 below that of past 4 years. Contoocookville, mean 4°25 below that of past 10 years; coldest occurred in 1875. *New Jersey:* Newark, mean 24°4 or 4°.65 below that of past 37 years and colder than any January during that period except, as follows: 1856, 21°.55; 1857, 19°.33; 1865, 23°.15; 1867, 22°.67 and 1875, 22°.92. *New York:* Palermo, coldest in past 28years. North Volney, mean 8°.28 below that of past 12 years; coldest in 1885. Waterburg, mean 5°.07 below that of past 10 years. Greece, coldest in 40 years. *Texas:* Melissa, coldest ever experienced. *Virginia:* Wytheville, mean 5° below that of past 6 years. *Washington Territory:* Neah Bay, mean 3° above that of 1880. Bainbridge Island, mean 1°.2 above that of 1880. *Wisconsin:* Embarrass, coldest ever experienced. Madison, mean 5°.4 below that of past 13 years.

Minimum Temperatures.—The following collection of data relative to the lowest temperatures of the month has been obtained principally from the reports of Voluntary Observers: Elmira, Ill., —32°, lowest temperature in past 19 years. Vail, Ia., 9th, extremely low temperatures throughout the day ranging from —10° to —40° as follows: 7:45 a. m., —40°; 8:30 a. m., —36°; 9 a. m., —26°; 10 a. m., —20°; 11 a. m., —18°; 12 m., —15°; 1 p. m., —12°; 2 p. m., —11°; 3 p. m., —10°; 4 p. m., —10°; 5 p. m., —12°, 6 p. m,, —16°; 7 p. m., —17°; 9 p. m., —15°; 10 p. m., —17°. Logan, Ia., —28°, lowest in past 28 years. Nora Springs, Ia., —24°, lowest in many years, in vicinity another thermometer records —36. Manhattan, Kan., —18°, lowest since 1859. Clay Center, Kan., —31°, remarkably low. Sandy Springs, Md., 1st, marks the close of the coldest period of three days ever recorded at this station; minimum temperature at station —10°; in a low valley half-a-mile distant —24°. Billerica, Mass., extremely low temperature at station, —24°, other points in town, —22°, —26° and —28°. St. Louis, Missouri, Weather Service reports a minimum temperature of —9° at the central station for January, 1881, as compared with —23° reported by Engelman in 1873. Contoocookville, N. H., at station, —20°, in other parts of village having a lower altitude —30°. North Volney, N. Y., —15°, lowest in past 12 years, except 1871,

when it was —19°. Wytheville, Va., 7°, lowest in past 6 years. Embarrass, Wis., —38°, lowest in many years. Stevens Point, Wis., 10th, —52°, lowest ever recorded. Ft. Benton, Mont., 29th, —59°, mean temperature of day —54°, coldest weather ever experienced. Dubuque, Ia., 10th, —25°, lowest since 1875; sparrows by the hundreds were found frozen to death. Cape Lookout, N. C., 1st, coldest in past 20 years as stated by the oldest inhabitants. Jacksonville, Fla., 5th, coldest since 1837, except 1857; all oranges on trees frozen: minimum temperatures at Green Cove, Fruit Cove, Mandarin and Beauclerc, 20°, Hibernia, 18°, Palatka, 23°; oranges badly frozen at all places; Picolata, 24°, fruit not injured; Panasofkee Lake, Sumter Co., no damage except to tender buds on young trees. Watertown, N. Y., 15th, —14°, lowest for several years. Greece, N. Y., 31st, extremely cold, snow has remained upon the ground for a longer period than ever before experienced; a cellar wall laid on the 16th of November, 1880, froze solid that night and has remained so up to date. Poughkeepsie, N. Y., 1st, —12° to —15°; reports from Pleasant Valley, Pine Plains and Millerton show a minimum of —25° to —30°; along river, —15° to —20°. Petersburg, Va., 1st, —4°, coldest in past 25 years; birds frozen to death in the fields. Fredericksburg, Va., 1st, —22°; much suffering among the people; cattle and game frozen to death. New Brunswick, 1st, in interior of province exceedingly cold; at Woodstock —22°; Sussex, —20° and at Rothesay —10°.

The following are the maximum and minimum temperatures reported in each State and Territory:

Maximum Temperatures.—Alabama: 72° at Mobile. *Arizona:* 84° at Tucson. *Arkansas:* 68° at *Mount Ida and 64° at Little Rock. *California:* 76° at *Fresno, *Delano and *San Fernando and 71° at Los Angeles. *Colorado:* 65° at *Trinidad and 63° at Denver. *Connecticut:* 46° at New London. *Dakota:* 54° at *Fort Meade and 47° at Deadwood. *Delaware:* 50° at Delaware Breakwater. *District of Columbia:* 44° at Washington. *Florida:* 84° at Key West. *Georgia:* 73° at *Thomasville and 70° at Savannah. *Iowa:* 48° at *Glenwood and 46° at Keokuk. *Idaho:* 52° at Boise City. *Illinois:* 55° at Cairo. *Indiana:* 54° at *Laconia and 47° at Indianapolis. *Indian Territory:* 64° at Fort Sill. *Kansas:* 55° at Dodge City. *Kentucky:* 63° at *Bowling Green and 54° at Louisville. *Louisiana:* 75° at New Orleans. *Maine:* 42° at Eastport. *Maryland:* 46° at *Cumberland and *Woodstock and 45° at Baltimore. *Massachusetts:* 48° at Boston. *Michigan:* 43° at Port Huron. *Minnesota:* 35° at St. Vincent and St. Paul. *Mississippi:* 71° at Vicksburg. *Missouri:* 54° at *Pierce City and 48° at St. Louis. *Montana:* 47° at Fort Custer. *Nebraska:* 64° at *Fort Sheridan and 45° at North Platte. *Nevada:* 54° at Winnemucca. *New Hampshire:* 39° at *Auburn and 25° on summit of Mount Washington. *New Jersey:* 50° at Atlantic City. *New Mexico:* 73° at La Mesilla. *New York:* 48° at *Friendship and 45° at Rochester. *North Carolina:* 68° at *Franklin and 66° at Wilmington. *Ohio:* 52° at Cincinnati. *Oregon:* 57° at Roseburg and Portland. *Pennsylvania:* 52° at Pittsburg. *Rhode Island:* 49° at Newport. *South Carolina:* 67° at Charleston. *Tennessee:* 65° at Memphis. *Texas:* 93° at *Fort Ringgold and 85° at Rio Grande City. *Utah:* 51° at Salt Lake City. *Vermont:* 40° at *Charlotte and 37° at Burlington. *Virginia:* 60° at Lynchburg. *Washington Territory:* 53° at Olympia. *West Virginia:* 52° at Morgantown. *Wisconsin:* 52° at *Neillsville and 37° at Milwaukee. *Wyoming:* 56° at Cheyenne.

Those marked with a star (*) are reported by U. S. Army Post Surgeons or Voluntary Observers.

Minimum Temperatures.—Alabama: 23° at *Green Springs and 24° at Montgomery. *Arizona:* 4° at Fort Apache. *Arkansas:* 8° at *Mount Ida and 18° at Little Rock. *California:* 3° at *Truckee and 18° at Campo. *Colorado:* —38° at *Ft. Lewis and —32° at Pike's Peak. *Connecticut:* —20° at *Mystic and —5° at New Haven. *Dakota:* —55° at *Fort Stevenson and —44° at St. Vincent. *Delaware:* 0° at *Dover and 12° at Delaware Breakwater. *District of Columbia:* —14° at Washington. *Florida:* 29° at Pensacola. *Georgia:* 18° at Atlanta. *Iowa:* —40° at *Vail and —25° at Dubuque. *Idaho:* 1° at *Ft. Lapwai and 13° at Boise City. *Illinois:* —32° at *Elmira and —15° at Champaign. *Indiana:* —13° at *Spiceland and —6° at Indianapolis. *Indian Territory:* —17° at Fort Supply. *Kansas:* —21° at *Fort Wallace and —18° at Dodge City. *Kentucky:* 0° at *Bowling Green and 8° at Louisville. *Louisiana:* 23° at Shreveport. *Maine:* —18° at *Orono and *Gardiner and —1° at Eastport. *Maryland:* —17° at *Woodstock and —6° at Baltimore. *Massachusetts:* —21° at *Billerica and —2° at Boston. *Michigan:* —26° at Marquette and Escanaba. *Minnesota:* —44° at St. Vincent. *Mississippi:* 23° at Fayette and 26° at Vicksburg. *Missouri:* —24° at *Ashley and —9° at St. Louis. *Montana:* —32° at Fort Keogh. *Nebraska:* —32° at *De Soto and —27° at North Platte. *Nevada:* 6° at Pioche. *New Hampshire:* —30° on summit of Mount Washington and —22° at *Grafton. *New Jersey:* —24° at *Ateo and 0° at Atlantic City. *New Mexico:* —9° at Santa Fe. *New York:* —30° at *Madison Barracks and —10° at Albany. *North Carolina:* 5° at *Lenoir and 11° at Charlotte. *Ohio:* —17° at Westerville and —3° at Columbus. *Oregon:* 6° at *Ft. Klamath and 8° at Umatilla. *Pennsylvania:* —22° at *Wellsboro and 3° at Pittsburg. *Rhode Island:* 5° at Newport. *South Carolina:* 23° at *Aiken and 30° at Charleston. *Tennessee:* 1° at *Rugby and 9° at Knoxville. *Texas:* —3° at Graham. *Utah:* —9° at *Coalville and 2° at Salt Lake City. *Vermont:* —26° at *Woodstock and —13° at Burlington. *Virginia:* —18° at *Mount Solon and —8° at Fort Whipple. *Washington Territory:*

—2° at Dayton. *West Virginia:* —17° at *Flemington and —2° at Morgantown. *Wisconsin:* —40° at *Neillsville and —30° at La Crosse. *Wyoming:* —34° at Fort Petterman and —12° at Cheyenne.

Those marked with a star (*) are reported by U. S. Army Post Surgeons or Voluntary Observers.

Ranges of Temperature at Signal Service Stations.—Monthly ranges in general varied from 40° to 80° over the country east of the Rocky Mountains. Ranges less than 50° occurred in the following districts: New England and Middle States, along the immediate coasts; throughout the South Atlantic and East Gulf States; in the West Gulf States east of a line including the stations of Galveston, Shreveport and Little Rock; throughout the Lower Lake region and the lower peninsula of Michigan; in central Tennessee; within the immediate region of the Ohio river and throughout the Middle Plateau and Pacific coast regions. The smallest ranges were: San Francisco, 19°; Key West, 23°; Portsmouth, N. C., 26; Sacramento, 29°; Olympia, 30°; Sandy Hook, 32°; Portland, Or., 33°; Smithville, Los Angeles and San Diego, 34°; Punta Rassa, 35°; Charleston, 37°; Portland, Me., Umatilla, Augusta, Savannah, Wilmington and Cape May, 38°; Detroit, Wood's Holl, Mobile, Jacksonville and Winnemucca, 39°. The largest were Uvalde, Tex., 87°; Camp Thomas, Ariz., 84°; St. Vincent, Minn., 79°; Fort Custer, Mont., and Concho and Fort Davis, Tex., 78°; Forts Keogh and Buford, 77°; Forts Gibson and Supply, Ind. Ty., 75°. The *daily ranges* varied in the different districts as follows: New England, from 19° at Thatcher's Island to 43° at Burlington; Middle States, 25° at Chincoteague, Cape May and Sandy Hook to 36° at Cape Henry; South Atlantic States, 24° at Charleston and Fort Macon to 30° at Augusta and Wilmington; East Gulf States, 14° at Key West to 32° at Montgomery; West Gulf States, 24° at New Orleans to 46° at Corsicana; Ohio valley and Tennessee, 27° at Louisville to 42° at Morgantown; Lower Lakes, 23° at Detroit to 38° at Cleveland; Upper Lakes, 30° at Alpena to 45° at Milwaukee; Upper Mississippi valley, 35° at St. Paul to 46 at Davenport and Keokuk; Red River of the North valley, 34° at Moorhead to 35° at St. Vincent; Missouri valley, 29° at Omaha to 42° at Leavenworth; Texas, 34° at Brownsville to 53° at Castroville and Uvalde; Eastern Rocky Mountain slope, 36° at Fort Sill to 51° at Deadwood; Rocky Mountains, 30° at Eagle Rock to 47° at Cheyenne; Middle Plateau, 25° at Pioche and Salt Lake City to 30° at Winnemucca; Southern Plateau, 34° at Yuma to 48° at Florence, Tucson and El Paso; Pacific coast regions, 14° at San Francisco and 17° at Portland, Or., to 45° at Campo.

Frost—Was reported as almost of daily occurrence from all stations north of the 35th parallel. Southward of that line, in the various States, on the following dates: South Carolina, 12th, 13th, 26th to 30th; Georgia, 2d, 3d, 7th, 12th, 13th, 15th, 16th, 22d, 23d, 25th to 29th; Florida, western portion, 1st, 2d, 3d, 12th, 24th to 29th; eastern portion, north of Punta Rassa, 26th, 28th; Alabama, 2d, 7th, 12th, 13th, 15th, 25th to 29th; Mississippi, 1st, 2d, 7th, 9th, 11th, 12th, 15th, 22d, 23d to 26th, 29th; Louisiana, 1st, 2d, 8th, 11th, 12th, 24th to 26th; New Orleans, 31st, it is estimated that one-half of the orange crop has been destroyed by freezing, and a large number of the young trees killed, cotton and sugar crops have also suffered to a great extent; Texas, 1st to 29th; southern New Mexico, 7th, 8th, 9th, 18th, 19th, 30th, 31st; southern Arizona, 1st, 4th, 5th, 6th, 7th, 17th, 18th; southern California, 3d, 7th, 9th, 10th, 12th, 18th, 27th, 28th.

Ice.—Its formation in the northern sections of the country is fully considered under the head of "*Ice in Rivers and Harbors.*" To the southward of the 33d parallel it formed of slight thickness in the various States on the following dates: Georgia, 1st, 2d, 3d; northwestern Florida, 23d, 24th, 25th; Alabama, 1st, 9th, 12th; Mississippi, 9th, 10th, 11th, 22d to 26th; Louisiana, 1st, 2d; Texas, 1st to 20th, 22d to 31st; Arizona, 1st, 5th, 7th to 11th, 23d, 24th.

PRECIPITATION.

The distribution of rain-fall for January, 1881, is shown on chart No. III, as determined from the regular Signal Service stations and about 450 reports of army post surgeons and voluntary observers. The table on the chart shows the average precipitation for each district, as compared with that of the present month. An excess of rain or snow-fall has occurred in the districts on the Atlantic and East Gulf coasts, varying from 3.80 inches in Florida to 0.83 inches in New England. In the Middle and North Pacific coast region the excess has ranged from 2.61 to 2.16, while the greatest deficiency is reported from the South Pacific coast region, where it amounts to 1.26 in. In Missouri, Tennessee and the Ohio valley and the Lower Lake region, the amount of rain and snow-fall has been from one-half to one inch less than the average for the month, and in all other districts not previously named there has been a slight excess, except, possibly, the region lying south of the Platte river and north of Texas. In this region the stations are so limited in number that it is not possible to give full and accurate information, but the indications are that the rain-fall has been very slight in this region.

Special Heavy Rains.—3rd, Ft. Barrancas, Fla., 4.75 inches. 3rd and 4th, Pensacola, 3.76; Vicksburg, 3.66; Fayette, Miss., 2.70. 5th and 6th, White Plains, N. Y., 3.20. 8th, Jacksonville, 3.08. 8th and 9th, Cedar Keys, 4.97; St. Augustine, Fla., 3.93. 9th and 10th, Freehold, N. J., 4.06; Fall River, Mass., 4.60; White Plains, N. Y., 3.00; Barnegat, 3.87;